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IS 7778-1 (2003): Small Tools Sampling Inspection Procedures, Part 1: Twist Drills, Countersink and Counterbores [PGD 32: Cutting tools]



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भाग 1 ऐंठित बरमें, काउंटरसिंक एवं काउंटरबोरस

(पहला पुनरीक्षण)

Indian Standard

SMALL TOOLS SAMPLING INSPECTION
PROCEDURES

PART 1 TWIST DRILLS, COUNTERSINK AND COUNTERBORES

(*First Revision*)

ICS 25.100.30

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BUREAU OF INDIAN STANDARDS
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FOREWORD

This Indian Standard (Part 1) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by Drills, Reamers and Threading Tools Sectional Committee had been approved by the Basic and Production Engineering Division Council.

This standard was first published in 1975. In the light of experience gained over the years, in this revision following changes have been incorporated:

- a) Definition of various terminologies used in the standard have been aligned with the practice followed at ISO level,
- b) Scale of sampling and criteria of conformity have been modified,
- c) Classification of non-conformities for various type of cutting tools have been updated, and
- d) To cater the specific need of the different industries and to make this standard user friendly, this standard has been splitted in 11 Parts for easy adoption/acceptance and guide updation.

This standard has been prepared based on prevalent practice and experience available in the Indian Industries. While formulating this standard considerable assistance has been derived from IS 2500 (Part 1) : 2000 'Sampling inspection procedures: Part 1 Attribute sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection (*third revision*)'. IS 7778 'Small tools sampling inspection procedures' is now being published in 11 Parts. Other parts of the standard are given below:

- | | |
|---------|---|
| Part 2 | Reamers |
| Part 3 | Sleeves, sockets and adaptors |
| Part 4 | Screwing taps, dies and knurling tools |
| Part 5 | Milling cutters |
| Part 6 | Milling arbors and accessories |
| Part 7 | Gear cutting tools and broaches |
| Part 8 | Saws |
| Part 9 | Single point (HSS and carbide tipped) tools |
| Part 10 | Carbide tips and indexable inserts |
| Part 11 | Hard metal burrs |

Indian Standard

SMALL TOOLS SAMPLING INSPECTION PROCEDURES

PART 1 TWIST DRILLS, COUNTERSINK AND COUNTERBORES (*First Revision*)

1 SCOPE

This standard (Part 1) specifies sampling plans and procedures for twist drills, countersink and counterbores submitted for inspection in lots.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
2500 (Part 1) : 2000	Sampling inspection procedures: Part 1 Attribute sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection (<i>third revision</i>)
4905 : 1968	Methods for random sampling

3 TERMINOLOGY AND DEFINITIONS

For the purpose of this standard the following definitions shall apply. For terms not defined below and for other clarifications, reference may be made to IS 2500 (Part 1).

3.1 Defect — A departure of a quality characteristic that results in a product, process or service not satisfying its intended normal usage requirements.

3.2 Non-Conformity — A departure of a quality characteristic that results in a product, process or service not meeting a specified requirement. Non-conformities will generally be established by their degree of seriousness, such as:

- | | |
|---------|---|
| Class A | — Those non-conformities of a type considered to be of the highest concern for the product or service. In acceptance sampling, such types of non-conformity will be assigned very small AQL values. |
| Class B | — Those non-conformities of a type considered to have the next lower |

degree of concern. Therefore these can be assigned a larger AQL value than those in Class A and smaller than in Class C, if a third class exists.

3.3 Non-Conforming Unit — A unit of product or service containing at least one non-conformity. Non-conforming units will generally be classified by their degree of seriousness such as:

- | | |
|---------|--|
| Class A | — A unit which contains one or more non-conformities of Class A and may also contain non-conformities of Class B and/or Class C. |
| Class B | — A unit which contains one or more non-conformities of Class B and may also contain non-conformities of Class C, but contains no non-conformity of Class A. |

3.4 Percent Non-Conforming — The percent non-conforming of any given quantity of units of products is 100 times the number of non-conforming units divided by the total number of units of products, that is:

Percent non-conforming

$$= \frac{\text{Number of non-conforming units}}{\text{Total number of units}} \times 100$$

3.5 Acceptable Quality Level (AQL) — When a continuous series of lots is considered, the quality level which for the purpose of sampling inspection is a limit of a satisfactory process average.

3.6 Sampling Plan — A specific plan which indicates the number of units of products from each lot which are to be inspected (sample size or series of sample sizes) and the associated criteria for determining the acceptability of the lot (acceptance and rejection numbers).

3.7 Lot — A collection of units of product from which a sample shall be drawn and inspected to determine conformance with the acceptability criteria, and which may differ from a collection of units designated as a lot for other purposes (for example, production, shipment, etc).

3.8 Sample — A sample consists of one or more units of product drawn from a lot, the units of the sample being selected at random without regard to their quality. The number of units of product in the sample is the sample size.

4 SCALE OF SAMPLING

4.1 All small tools shall be selected at random from a lot as per IS 4905 to ensure randomness of selection.

4.2 Small tools shall be selected and examined for each lot separately for ascertaining its conformity to the requirements of the relevant specification.

The number of small tools to be selected from a lot shall depend on the sizes of the lot and type of sampling plans and shall be in accordance with Tables 1, 2 and 3.

5 DETERMINATION OF ACCEPTABILITY

5.1 To determine acceptability of a lot under percent non-conforming inspection, the single sampling plan shall be used in accordance with 5.1.1 for hardness test and performance test and the double sampling plan shall be used in accordance with 5.1.2 for dimensional and visual characteristics.

5.1.1 Single Sampling Plan

The number of sample units inspected shall be equal to the sample size given by the plan. If the number of non-conforming units found in the sample is equal to or less than the acceptance number, the lots shall be considered acceptable. If the number of non-conforming units is equal to or greater than the

rejection number, the lot shall be considered not acceptable.

5.1.2 Double Sampling Plan

The number of sample units first inspected shall be equal to the first sample size given by the plan. If the number of non-conforming units found in the first sample is equal to or less than the first acceptance number, the lot shall be considered acceptable. If the number of non-conforming units found in the first sample is equal to or greater than the first rejection number, the lot shall be considered not acceptable.

If the number of non-conforming units found in the first sample is between the first acceptance and rejection numbers, a second sample of the size given by the plan shall be inspected. The number of non-conforming units found in the first and second samples shall be accumulated. If the cumulative number of non-conforming units is equal to or less than the second acceptance number, the lot shall be considered acceptable. If the cumulative number of non-conforming units is equal to or greater than the second rejection number the lot shall be considered not acceptable.

6 CLASSIFICATION OF NON-CONFORMITY

Non-conformities of various inspection parameters for HSS twist drills, carbide tipped twist drills and countersink and counter bore covered under various Indian Standards have been classified as Class A and Class B and are tabulated in Tables 4, 5 and 6.

Table 1 Scale of Sampling and Criteria for Conformity for Lot Quality for Visual and Dimensional Characteristics (Double Sampling Plan for Normal Inspection — Inspection Level III)

(Clause 4.2)

Sl No.	Lot Size	Sample	Sample Size	Cumulative Sample Size	Non-Conformity			
					Class A AQL 1.5		Class B AQL 4.0	
					Ac	Re	Ac	Re
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Up to 150	First	20	20	0	2	1	4
		Second	20	40	1	2	4	5
ii)	151 to 280	First	32	32	0	3	2	5
		Second	32	64	3	4	6	7
iii)	281 to 500	First	50	50	1	4	3	7
		Second	50	100	4	5	8	9
iv)	501 to 1 200	First	80	80	2	5	5	9
		Second	80	160	6	7	12	13
v)	1 201 to 3 200	First	125	125	3	7	7	11
		Second	125	250	8	9	18	19

Table 2 Scale of Sampling and Criteria for Conformity for Lot Quality for Hardness Test (Single Sampling Plan for Normal Inspections — Inspection Level I)

(Clause 4.2)

SI No.	Lot Size	Sample Size	AQL 1.5	
			Ac	Re
(1)	(2)	(3)	(4)	(5)
i)	Up to 280	8	0	1
ii)	281 to 1 200	32	1	2
iii)	1 201 to 3 200	50	2	3

Table 3 Scale of Sampling and Criteria for Conformity for Lot Quality for Performance Test (Single Sampling Plan for Reduced Inspection — Inspection Level S-3)

(Clause 4.2)

SI No.	Lot Size	Sample Size	AQL 4.0	
			Ac	Re
(1)	(2)	(3)	(4)	(5)
i)	Up to 150	2	0	1
ii)	151 to 3 200	5	0	2

Table 4 Classification of Non-Conformity in Twist Drills

(Clause 6)

SI No.	IS No.	Type of Tool	Class A Non-Conformity	Class B Non-Conformity
(1)	(2)	(3)	(4)	(5)
i)	5100	Twist drills, parallel shank, stub series	Hardness, Drill diameter, Point angle, Back taper and Run out	Flute length, Overall length and Helix angle
ii)	5101	Twist drills, parallel shank, jobber series	Hardness, Drill diameter, Performance point angle, Back taper and Run out	Flute length, Overall length and Helix angle
iii)	5102	Twist drills, parallel shank, long series	Hardness, Drill diameter, Performance point angle, Back taper and Run out	Flute length, Overall length and Helix angle
iv)	5103	Twist drills, morse taper shanks	Hardness, Drill diameter, Performance morse taper shank, Point angle, Back taper and Run out	Flute length, Overall length and Helix angle
v)	5104	Twist drills, over size morse taper shank	Hardness, Drill diameter, Morse taper shank, Point angle, Back taper and Run out	Flute length, Overall length and Helix angle
vi)	5105	Twist drills, taper square shanks for ratchet braces	Hardness, Drill diameter, Square shank, Point angle, Back taper and Run out	Flute length, Overall length and Helix angle
vii)	5106	Twist drills, taper square shanks for carpenters braces	Hardness, Drill diameter, Square shank, Point angle, Back taper and Run out	Flute length, Overall length and Helix angle
viii)	5362	Twist drills, parallel shank, stub series, left hand cutting for automatics	Hardness, Drill diameter, Point angle, Back taper and Run out	Flute length, Overall length and Helix angle
ix)	5363	Micro drills	Hardness, Drill diameter, Shank diameter, Point angle, Back taper and Run out	Flute length, Overall length and Helix angle
x)	5364	Twist drills for taper pin holes with taper 1: 50	Hardness, Drill diameter, Shank diameter, Morse taper shank, Taper angle, Point angle and Run out	Flute length, Overall length and Helix angle
xi)	5365	Core drills, parallel shank	Hardness, Core drill diameter, Run out and Back taper	Flute length, Overall length and Helix angle
xii)	5366	Core drills, morse taper shank	Hardness, Core drill diameter, Morse taper shank, Back taper and Run out	Flute length, Overall length and Helix angle
xiii)	6708	Centre drills—Type A	Hardness, Pilot diameter, Shank diameter and Point angle	Pilot length, Overall length and 60° angle
xiv)	6709	Centre drills—Type B	Hardness, Pilot diameter, Shank diameter and Point angle	Pilot length, Overall length, 60° and 120° angle and d_2 diameter
xv)	6710	Centre drills—Type R	Hardness, Pilot diameter, Shank diameter and Point angle	l length, Overall length and Radius
xvi)	7766	Twist drills for jig boring machines	Hardness, Drill diameter, Morse taper shank and Radial runout	Flute length, Overall length and Helix angle

Table 4 (Concluded)

SI No.	IS No.	Type of Tool	Class A Non-Conformity	Class B Non-Conformity
(1)	(2)	(3)	(4)	(5)
xvii)	7772	Shell core drills	Hardness, Drill diameter, Bore diameter and Runout	Length, d_2 diameter, Driving slot, Width, Depth and Helix angle
xviii)	7822	Twist drills, morse taper shank, extra long series	Hardness, Drill diameter, Morse taper shank, Runout and Point angle	Flute length, Overall length and Helix angle
xix)	7823	Twist drills, parallel shank, extra long series	Hardness, Drill diameter, Shank diameter, Runout and Point angle	Flute length, Overall length and Helix angle
xx)	8305	Twist drills, morse taper shank, long series	Hardness, Drill diameter, Morse taper shank, Runout and Point angle	Flute length, Overall length and Helix angle
xxi)	12687	Sub land twist drills with morse taper shanks for holes prior to tapping screw threads	Hardness, Drill diameter, Step diameter, Morse taper shank, Runout, Point angle and Countersink angle	Flute length, Overall length, Step length and Helix angle
xxii)	12688	Sub land twist drills with morse taper shanks for clearance holes and countersinks for countersunk head screws	Hardness, Drill diameter, Step diameter, Morse taper shank, Runout, Point angle and Countersink angle	Flute length, Overall length, Step length and Helix angle
xxiii)	12689	Sub land twist drills with parallel shank for clearance holes and counterbores for slotted cheese head screws	Hardness, Drill diameter, Step diameter, Shank diameter, Runout and Point angle	Flute length, Overall length, Step length and Helix angle
xxiv)	12690	Sub land twist drills with morse taper shanks for clearance holes and counterbores for slotted cheese head screws	Hardness, Drill diameter, Step diameter, Morse taper shank, Runout and Point angle	Flute length, Overall length, Step length and Helix angle
xxv)	12691	Sub land twist drills with parallel shank for holes prior to tapping screw threads	Hardness, Drill diameter, Step diameter, Shank diameter, Runout point angle and Countersink angle	Flute length, Overall length, Step length and Helix angle
xxvi)	12692	Sub land twist drills with parallel shank for clearance holes and countersinks for countersunk head screws	Hardness, drill diameter, Step diameter, Shank diameter, Runout point angle and Countersink angle	Flute length, Overall length, Step length and Helix angle

Table 5 Classification of Non-Conformity in Carbide Tipped Drills
(Clause 6)

SI No.	IS No.	Type of Tool	Class A Non-Conformity	Class B Non-Conformity
(1)	(2)	(3)	(4)	(5)
i)	8306	Carbide tipped twist drills morse taper shanks	Hardness on shank, Drill diameter and Morse taper shank	Flute length, Overall length and Point angle
ii)	8307	Carbide tipped twist drills parallel shanks	Hardness on shank, Drill diameter and Shank diameter	Flute length, Overall length and Point angle
iii)	9771	Carbide tipped core drills with morse taper shanks	Hardness on body and tang, Drill diameter and Morse taper shank	Flute length and Overall length

Table 6 Classification of Non-Conformity in Countersinks and Counterbores
(Clause 6)

Sl No.	IS No.	Type of Tool	Class A Non-Conformity	Class B Non-Conformity
(1)	(2)	(3)	(4)	(5)
i)	5693	Countersinks 90° parallel shank and solid pilots	Hardness, Cutter diameter, Pilot diameter, Shank diameter and Countersink angle	Cutting edge length, Shank length and Overall length
ii)	5703	Countersinks with morse taper shank	Hardness, Countersink diameter, Morse taper shank and Countersink angle	Cutting edge length, Overall length, d_2 and d_3 diameters and l_3 and l_4 lengths
iii)	5704	Counterbore with parallel shank and solid pilots	Hardness, Counterbore diameter, Pilot diameter and Shank diameter	Cutting edge length, Overall length and Shank length
iv)	5705	Pilots for countersinks and counterbores	Hardness, Shank diameter and Head diameter	Head length and Overall length
v)	5710	Counterbore with morse taper shank	Hardness, Counterbore diameter and Morse taper shank	Cutting edge length, Overall length, d_2 and d_3 diameters and l_3 and l_4 lengths
vi)	13303	Countersinks 60°, 90° and 120° with morse taper shank	Hardness and Morse taper shank	Nominal diameter, Small diameter, Body length, Overall length and Countersink angle
vii)	13304	Countersinks 60°, 90° and 120° with parallel shank	Hardness and Shank diameter	Nominal diameter, Small diameter, Body length, Overall length and Countersink angle

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